NOTICES FROM THE LICK OBSERVATORY.*

PREPARED BY MEMBERS OF THE STAFF.

THE ORBIT OF ϵ *HYDRÆ* AB.

It has been known almost from the time of its discovery by SCHIAPARELLI in 1888 that the close double star known as AB of ϵ *Hydræ* is a binary system in rapid motion. Measures made by BURNHAM with the 36-inch telescope in the years 1888 to 1892 showed an increase in angle of 40° in the four years. Later observations at Greenwich and, since 1898, at the Lick Observatory, gave evidence that the rate of motion was increasing, the angular change in the twelve years from discovery to 1900 amounting to 150°. But this arc was not sufficient to warrant any conclusions as to the form of the orbit, or even as to the approximate period of revolution.

In 1901 I examined this star with the 36-inch on several nights, but could see no measurable elongation. But on November 15, 1902, I found no difficulty in measuring the pair. The disks of the two components were distinctly separated, and one was sensibly smaller than the other, so that there was no doubt about the quadrant. The smaller star was in the second quadrant, as it had been at the time of discovery in 1888, and had described an arc of 200° in the three years since my measures in 1900. This result was confirmed by two measures secured in February and March of this year.

The mean of SCHIAPARELLI's measures in 1888, as given by BURNHAM,† is:—

1888.28	142°.0	0″.21	6^n

and my recent measures are:—

1902.873	126°.6	0″.17
1903.139	132 .8	0 .21
.177	136 .9	0 .18
1903.06	132°.1	0″.19

* Lick Astronomical Department of the University of California.

† *Publications of the Lick Observatory*, Vol. II, p. 68.

Plotting these measures and those made in the intervening years, as given in Table I, I found it possible to represent them satisfactorily by an ellipse, from which, by graphical methods, I derived the following set of elements:—

$T = 1901.1$	$\Omega = 109^\circ.5$
$P = 15.7$ years	$i = 35.5$
$e = 0.685$	$\lambda = 264.7$
$a = 0''.24$	$n = +22.293$

These results are considered as approximate only. When further observations have been secured, some of the elements will probably require considerable correction; but, as will be seen from Table I, the observations so far published are represented satisfactorily. The two components of the system differ fully two magnitudes in brightness, and their maximum apparent separation is only 0".25. It is therefore a difficult pair to measure, even with the most powerful telescopes.

There is a third star about 3" distant which with the close pair forms the double star Σ 1273. The angular motion of C about the bright star has amounted to about 38° since 1830, without material change in the distance. It is thus evident that we have here a ternary system.

Still further interest attaches to this star from the fact that spectrographic observations show that its velocity in the line of sight is variable.*

At present it is not possible to say what the period of the spectroscopic binary is, but it is comparatively a long one. It is interesting to note that the plates showing the maximum velocity (+43 kilometers) were taken when the visual binary was near the line of nodes; while the plate showing the minimum velocity (+28 kilometers) was taken after the visual binary had described an arc of about 180° and was again near the line of nodes. This may mean that the visual and spectroscopic binaries are identical, but further evidence is needed to determine this question with certainty.

The table that follows gives the data on which my orbit is based, and shows the agreement between the computed and observed places. It includes all complete measures that I have been able to find, except those made at Greenwich in 1901. These measures place the smaller star in the fourth quadrant instead of the first, and hence have residuals exceeding 90°.

* See Lick Observatory Bulletin No. 4, and *Publications* A. S. P., Vol. XIII, p. 164.

TABLE I.

Date.	θ_o	θ_c	ρ_o	ρ_c	$\Delta\theta(o-c)$	$\Delta\rho(o-c)$	Observer.	n
1888.28	142°.0	145°.7	0″.21	0″.23	− 3°.7	− 0″.02	SCHIAPARELLI	6
1888.98	154 .4	153 .0	0 .26	0 .24	+ 1 .4	+ 0 .02	BURNHAM	2
1890.92	170 .0	170 .8	0 .19	0 .24	− 0 .8	− 0 .05	BURNHAM	2
1892.18	179 .6	182 .3	0 .21	0 .24	− 2 .7	− 0 .03	BURNHAM	2
1896.21	212 .0	223 .3	0 .22	0 .22	− 11 .3	± 0 .00	LEWIS........	3
1898.14	250 .7	246 .5	0 .18	0 .20	+ 4 .2	− 0 .02	AITKEN	1
1899.15	261 .3	261 .3	0 .22	0 .18	± 0 .0	+ 0 .04	AITKEN	3
1899.23	263 .5	262 .6	0 .21	0 .18	+ 0 .9	+ 0 .03	LEWIS........	4
1899.92	274 .8	276 .2	0 .18	0 .15	− 1 .4	+ 0 .03	AITKEN	1
1900.18	293 .4	283 .1	0 .13	0 .13	+ 10 .3	± 0. 00	AITKEN	3
1900.24	267 .2	284 .9	0 .20	0 .13	− 17 .7	+ 0 .07	LEWIS........	1
1903 06	132 .1	129 .9	0 .19	0 .20	+ 2 .2	− 0 .01	AITKEN	3

March 14, 1903. R. G. AITKEN.

THE PRESSURE OF LIGHT AND HEAT AND THE EXPERIMENTAL PRODUCTION OF AN APPEARANCE RESEMBLING THE TAIL OF A COMET.

At the recent meeting of the American Physical Society in Washington, a paper* was presented by Professor E. F. NICHOLS and G. F. HULL giving the final results of their experiments upon the pressure of heat and light. With the improvements in the apparatus suggested by their early trials, very accurate results have been obtained. The observed pressures agreed *within one per cent* of those computed from theory.

The effect of wave-lengths on the pressure was tested. The pressure was found to be independent of the wave-length and to depend only upon the energy of the radiations. This is in accordance with the theory.

A very interesting application of this pressure effect was made by the investigators in the production of an appearance resembling a comet's tail. A powder consisting of a mixture of emery and puff-ball spores was placed in a vacuum-tube somewhat resembling an hour-glass. The exhaustion of the tube was made as perfect as possible, and especial care was taken to get rid of any mercury vapor. When the powder was poured from one portion of the tube to the other and an

* "Pressure Due to Radiation." In the account of the meeting in *Science* of January 30, 1903.